Measurements: Body measurements (in mm) of 4 soldiers from Dehra Dun. Body length with mandibles 3.9-4.1; Head length with mandibles 1.66-1.81; without mandibles 1.05-1.16; Head width 1.02-1.05; Mandibles length 0.58-0.66; Postmentum (median) length 0.53-0.58; Max. width 0.42-0.44; Pronotum length 0.47-0.50, width 0.78-0.83; Antennal segments 16.

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25. STUDIES ON THE APHIDIDAE OF INDIA—XV. ON THE BIOMETRY OF MORPHOLOGICAL CHARACTERS OF *APHIS CRACCIVORA* KOCH. (APHIDIDAE, HOMOPTERA)

Introduction

Cottier (1953) studied variation in five different species of aphids viz., *Myzus persicae* (Sulz.), *Macrosiphum euphorbiae* (Thomas), *M. rosae* (L.), *Aulacorthum solani* (Kalt.) and *Aphis citricidus* (Kirk.) in New Zealand and emphasised the importance of the relative proportions which antennal segments bear to one another and to cornicles and cauda, in the determination of a species. He gave importance to the ratios of antennal segments IV, V, VI (base) and VI (flag.) to the antennal segment III and of cornicle and cauda to antennal seg. III and to each other in order to distinguish one aphid species from another. Other taxonomists like Theobald (1926-1929), Takahashi (1924), Eastop (1958, 1961), and Bodenheimer and Swirski (1957) have also in addition laid emphasis on the ratios of lengths of different parts of the body such as antenna/body, body/cauda, body/cornicle etc., in the determination of an aphid species. However, all this biometry applies to the adult alate and apter-

TABLE 1

MEAN MEASUREMENTS (IN MM) OF CHARACTERS OF DIFFERENT INSTARS OF *Aphis craccivora* Koch.

Characters (Lengths unless otherwise mentioned)	First instar	Second instar	Apterae Viviparae			Alatae Viviparae			
			Third instar	Fourth instar	Adult	Second instar	Third instar	Fourth instar	Adult
Body	0.738	1.176	1.231	1.469	1.992	1.094	1.183	1.422	1.808
Antenna	0.383	0.565	0.730	0.859	1.361	0.625	0.756	1.038	1.306
Antennal seg. III	0.122	0.136	0.208	0.149	0.332	0.162	0.223	0.197	0.293
Antennal seg. IV	*	0.081	0.113	0.126	0.241	0.089	0.120	0.176	0.252
Antennal seg. VI (base)*	0.050	0.070	0.081	0.089	0.117	0.075	0.080	0.098	0.119
Antennal seg. VI (flag.)	0.122	0.167	0.198	0.234	0.299	0.180	0.210	0.266	0.280
Cornicle	0.053	0.109	0.171	0.213	0.382	0.110	0.140	0.211	0.253
Basal breadth of cornicle	0.063	0.075	0.085	0.093	0.097	0.075	0.081	0.091	0.066
Apical breadth of cornicle	0.046	0.048	0.054	0.059	0.053	0.052	0.054	0.059	0.046

* Antennal segment IV is the ultimate segment of first instar and is homologous to the segment VI of fourth instar and adult. Similar homology exists for the segment V of second and third instars with the segment VI of later stages.

TABLE 2

RATIOS OF MEASUREMENTS OF DIFFERENT MORPHOLOGICAL CHARACTERS IN DIFFERENT INSTARS OF *Aphis craccivora* Koch.

Ratios of characters	Value of ratios	Apterae Viviparae					Alatae Viviparae			
		First instar	Second instar	Third instar	Fourth instar	Adult	Second instar	Third instar	Fourth instar	Adult
Antenna/body	0.60 ±0.12	0.51	0.48	0.59	0.58	0.68	0.57	0.63	0.72	0.72
Ant. seg. IV/III*	0.715±0.175	—	0.59	0.54	0.84	0.72	0.54	0.53	0.89	0.87
Ant. seg. VI (base)/III*	0.47 ±0.08	0.40	0.51	0.38	0.59	0.35	0.46	0.35	0.49	0.40
Ant. seg. VI (flag.)/III	1.235±0.335	1.0	1.22	0.95	1.57	0.90	1.11	0.94	1.35	0.95
Ant. seg. VI (flag.)/VI (base)	2.53 ±0.18	2.44	2.38	2.44	2.62	2.55	2.40	2.62	2.71	2.35
Length of cornicle/basal breadth	—	0.84	1.45	2.01	2.29	3.93	1.46	1.72	2.31	3.83
Length of cornicle/apical breadth	—	1.15	2.27	3.16	3.61	7.20	2.11	2.59	3.57	5.50
Basal breadth of cornicle/apical breadth	—	1.36	1.56	1.57	1.57	1.83	1.44	1.50	1.54	1.44
Length of cornicle/ant. seg. III	—	0.43	0.80	0.82	1.42	1.15	0.67	0.62	1.07	0.86
Body/cornicle	—	13.92	10.78	7.19	6.89	5.21	9.94	8.45	6.73	7.14

* See foot note under Table 1.

ous parthenogenetic forms. The question arises, can nymphal forms be determined by the application of biometry of adult forms? The present investigation deals with a study of ratios of morphological characters of nymphs and adult stages of the common bean aphid, *Aphis craccivora* Koch., in order to find an answer.

Material and Method

Apterous adult parthenogenetic forms of *A. craccivora* were collected in the field on *Dolichos lablab* in the University campus, Bhubaneswar during December 1973 and were maintained in the Laboratory. The young laid were kept separately in petri dishes on the leaves of the host plant and reared upto the adult condition. Such nymphs always developed into apterous adults. The mean temperature and humidity in the laboratory was 20.2°C and 66 per cent respectively. It is well known that alate forms are formed under various conditions, principal among which are overcrowding, food shortage and the physiological urge for migration. The first instar nymphs destined to develop into alate and apterous adults are alike. But in the second instar the respective nymphs can be distinguished (Behura, *et al.*). Such nymphs were collected in the field and reared in the laboratory in order to study the ratios of measurements of morphological characters of nymphs developing into alate.

Individuals of different instar nymphs were preserved separately in 70 per cent alcohol. Permanent slides were prepared as per technique described by Behura and Dash (1973). Measurements of different parts of the body of ten nymphs of each nymphal stage for alate and apterous forms were recorded and their ratios studied. The data are presented in Table 1. Ratios of important taxonomical characters were calculated and are set in Table 2.

Results and Conclusions

1. Taxonomic ratios (Table 2) viz., antenna/body, ant. seg. IV/III, VI (base)/III, VI (flag.)/III and VI (flag.)/VI (base) are constant in all nymphal instars and adults of apterous and alate forms of *A. craccivora*. However, the ratio of length of antennal seg. VI (flag.)/III is slightly greater in the fourth instar stage of both apterous and alate forms due to the division of seg. III after the third moult.

2. The ratios concerning the dimensions of the cornicle present some interesting results.

(a) The ratios of length of cornicle/basal breadth and length of the cornicle/apical breadth increase from first instar to the adult.

(b) The ratio, basal breadth of cornicle/apical breadth of cornicle in the apterous forms increases from first to third instar, remains constant in the fourth instar and then increases in the adult. This ratio in the alate forms however, increases from first to fourth instar and then decreases in the adult.

(c) The ratio, length of cornicle/ant. seg. III in both alate and apterous forms increases from first to fourth instar and then decreases in the adult.

(d) The ratio, length of the body/cornicle in apterous forms decreases from the first instar to adult, but in alate forms the decrease is only upto the fourth instar stage and then there is an increase in the adult.

Thus it appears, the ratios relating to the antennal segments are almost constant in nymphs and adults of apterae and alate but the ratios relating to the cornicle vary.

Summary

The important taxonomic ratios in the nymphs and adults of alate and apterous forms

of *Aphis craccivora* Koch., have been studied. The ratios antenna/body, ant. seg. IV/III, VI (base)/III, VI (flag.)/III and VI (flag.)/VI (base) remain almost constant in all the stages. But the ratios relating to the cornicle, such as length of cornicle/basal breadth, apical breadth and ant. seg. III, basal breadth/apical breadth and body/cornicle show variation.

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26. *DACTYNOTUS COMPOSITAE* (THEOBALD), A NEW APHID PEST OF MULBERRY (*MORUS* SPP.)

Periodical survey and study conducted on the pests of mulberry (*Morus* spp.) at Dharwar, Karnataka, during the year, 1974-75 revealed heavy infestation by *Dactynotus compositae* on mulberry, although safflower is the primary host plant of this insect. The aphids were found feeding in groups on tender shoots and also on the ventral surface of tender leaves. When nymphs of this aphid were enclosed on the twigs of mulberry, the aphids fed and developed successfully into adults. Another interesting feature observed during the period of investigation was most of the aphids on mulberry were alate forms. *D. compositae* has not been recorded as a pest of mulberry, so far.

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